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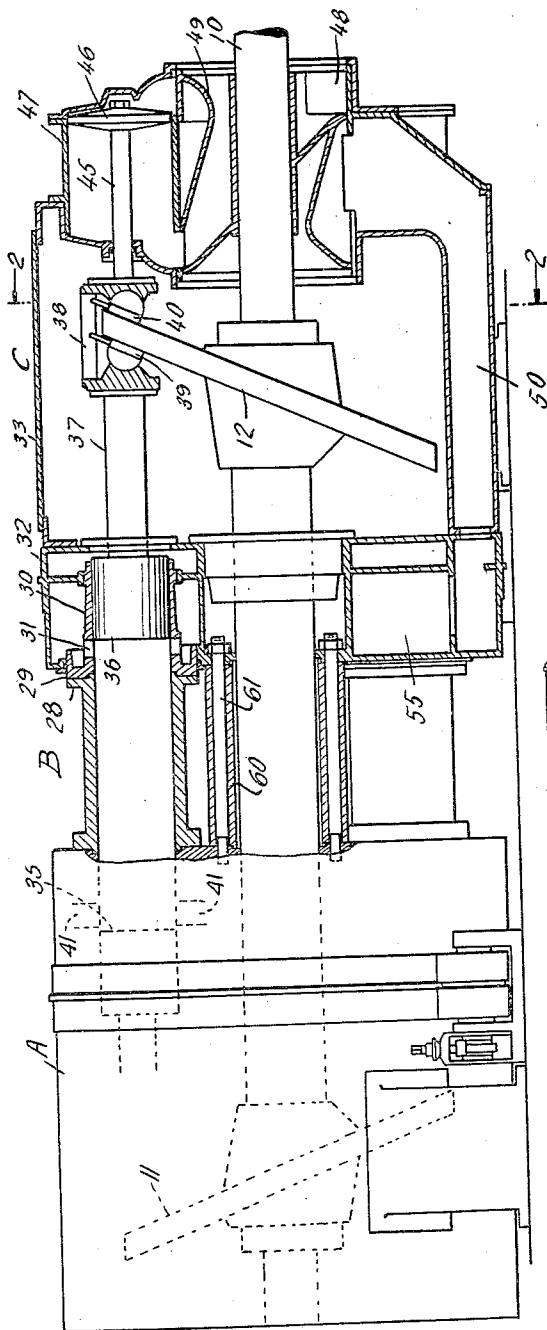


Fig. 1.

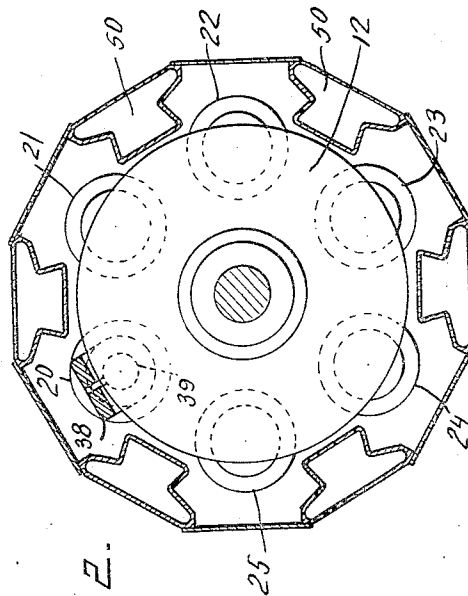


Fig. 2.

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ENGINE

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This invention relates to engines and particularly to internal combustion engines and to scavenging means therefor.

The invention has for its salient object to provide an engine with scavenging means including a pump and conduits connecting the pump to the engine cylinders and so constructed and arranged as to be disposed within the engine casing, thereby reducing the dimensions of the engine and strengthening the casing.

Further objects of the invention will appear from the following specification taken in connection with the drawing, which forms a part of this application, and in which

Fig. 1 is a longitudinal elevation, partly in section, of an engine constructed in accordance with the invention; and

Fig. 2 is a transverse sectional elevation taken substantially on line 2—2 of Fig. 1.

The invention briefly described consists of an engine comprising a plurality of cylinders, a scavenging pump disposed preferably at one end of the engine and conduits connecting the pump casing with the cylinders. The conduits are formed within the engine casing and extend longitudinally thereof. At their outlet ends, the conduits communicate with an annular chamber which in turn is adapted to communicate through suitable ports with the cylinders, the communication through the ports being controlled by the working pistons in the cylinders.

Further details of the invention will appear from the following description.

In the form of the invention illustrated in the drawing, there is shown an engine comprising three sections, A, B and C. The engine shaft 10 is mounted in suitable bearings in the sections A and C and extends through the central section B.

The engine particularly illustrated in the drawings transmits the reciprocating motion of the pistons to the shaft 10 by means of a pair of swash plates or slants 11 and 12 which are fixed to the shaft, and are disposed respectively in the sections A and C of the engine casing. The cylinders are disposed parallel to the shaft and are concentrically arranged, as shown in Fig. 2, six cylinders, 20,

21, 22, 23, 24, and 25 being shown. It will be understood, however, that any desired number of cylinders may be used.

The cylinders may be formed in any desired manner and in the embodiment of the invention shown in Fig. 1 each cylinder has formed thereon, at each end, a flange 28 which is secured to a flange 29 formed on an extension 30 of the cylinder. Each cylinder, furthermore, has a plurality of ports 31 through which the intake gas and the scavenging charge are admitted.

The end sections of the casing may be formed in one section or, as shown in Fig. 1, in two sections, 32 and 33, which are connected together.

Each cylinder has mounted therein a pair of oppositely acting pistons 35 and 36, each piston having secured thereto a rod 37 having a yoke 38. The yokes straddle the swash plate and each yoke has a pair of slipper pads 39 and 40 which communicate the reciprocating motion of the piston to the swash plate and have bearing surfaces engaging the opposite faces of the swash plate. One or more of the yokes 38 has secured thereto and extending therebeyond in axial alinement with the piston rod an extension rod 45 on the end of which is mounted a piston 46. The piston 46 is disposed in a pump cylinder 47 formed in the outer end of the section C of the engine casing. The pump cylinder 47 communicates with a valve chamber 48 in which is mounted a rotary valve 49.

The valve chamber 48 has suitable intake and discharge ports which communicate with a plurality of ducts or conduits 50 which, as shown in Fig. 2, are disposed alternately with relation to the cylinders of the engine. The conduits 50 are formed on the inside of the casing and in Fig. 2 are shown as angular in cross section. The disposition of the conduits within the casing has two important advantages, namely, reducing the outside dimensions of the engine and strengthening the engine casing. The valve 49 and the outlet ports between the valve casing and the conduits are so relatively constructed and arranged that, as the valve is rotated by the shaft, the valve casing having a compressed

charge of air therein will communicate successively with the ducts or conduits 50. The conduits 50 discharge into an annular chamber 55 which is in communication with the ports 31 and cylinders 20 to 25 inclusive. As the pistons uncover the ports 31 the scavenging charge of air enters the cylinders and effectively discharges the burnt gases therefrom and scavenges the cylinders. The exhaust ports are shown at 41.

Although the reciprocating type of scavenger pump is illustrated, it will be understood that any desired form of pump may be utilized to discharge the compressed air into the ducts or conduits from which the air passes into the cylinders.

In the form of the invention illustrated in Fig. 1, the cylinders are bolted to the end sections A and C and these sections are also connected by a central sleeve 60 which is secured to the end sections by bolts 61.

It will be obvious from the foregoing description that the engine constructed in the manner set forth will be compact and that the provision of the air ducts or conduits within the casing of the engine will cut down the dimensions of the engine and effectively strengthen the casing structure.

Although one specific embodiment of the invention has been particularly shown and described, it will be understood that the invention is capable of modification and that changes in the construction and in the arrangement of the various cooperating parts may be made without departing from the spirit or scope of the invention, as expressed in the following claims.

What I claim is:

1. An internal combustion engine comprising an engine casing, a shaft therein, a plurality of cylinders arranged parallel to and circumferentially around the shaft, pistons in said cylinders, operative connections between said pistons and said shaft, a pump disposed at one end of the casing and driven by the engine, and conduits formed integrally in said casing connecting the pump to the cylinders said conduits being located circumferentially around the shaft and each conduit being disposed between two cylinders.

2. An internal combustion engine comprising an engine casing, a shaft therein, a plurality of cylinders arranged parallel to the shaft, pistons in said cylinders, operative connections between said pistons and said shaft, a pump disposed at one end of the casing and driven by the engine, and conduits disposed within said casing connecting the pump to the cylinders, said conduits being disposed alternately with said cylinders.

3. An internal combustion engine comprising an engine casing, a plurality of cylinders having ports therein, working pistons in said cylinders controlling said ports, an annular chamber surrounding said cylinders

and having an axis parallel to the cylinder axes, said chamber communicating with said ports, an air pump at one end of the casing, and conduits connecting said pump with said chamber.

4. An internal combustion engine comprising an engine casing, a plurality of cylinders having ports therein, working pistons in said cylinders controlling said ports, a chamber surrounding said cylinders and communicating with said ports, an air pump at one end of the casing, and conduits within the casing connecting said pump with said chamber.

5. An internal combustion engine comprising an engine casing, an engine shaft, a plurality of cylinders having their axes parallel to said shaft and having ports therein, working pistons in said cylinders controlling said ports, a chamber surrounding said cylinders and communicating with said ports, an air pump at one end of the casing, said chamber being spaced from said pump, and conduits connecting said pump with said chamber.

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